BANGLADESH FLOOD ACTION PLAN

DRAFT

POLICY AND PLANNING GUIDELINES

FLOOD RESPONSE STUDY (FAP 14)

Prepared for

The Flood Plan Coordination Organization (FPCO)
of the
Ministry of Irrigation Water Development and Flood Control

October 15, 1992

ISPAN
IRRIGATION SUPPORT PROJECT FOR ASIA AND THE NEAR EAST
Sponsored by the U.S. Agency for International Development

BANGLADESH FLOOD ACTION PLAN

DRAFT

POLICY AND PLANNING GUIDELINES

FLOOD RESPONSE STUDY (FAP 14)

Prepared for

The Flood Plan Coordination Organization (FPCO)
of the
Ministry of Irrigation Water Development and Flood Control

October 15, 1992

IRRIGATION SUPPORT PROJECT FOR ASIA
AND THE NEAR EAST

ISPAN Technical Support Center
Room 1001
1611 North Kent Street
Arlington, Virginia 22209-2111
USA
Phone: (703)243-7911
FAX: (703)525-9137
TELEX: 276532 ISPAN UR

TABLE OF CONTENTS

POLICY AND PLANNING GUIDELINES FOR FLOOD RESPONSE

1. Introduction

1.1 Objectives

One objective of the Flood Response Study (FAP 14) specified in the terms of reference is:

> *To formulate guidelines and recommendations on ways of enhancing effective flood response measures that will be useful in the planning, design and operations of other FAP projects, especially the regional studies and FAP 23.*

Adopting the recommendations of the FAP 14 study and applying its guidelines should aid in integrating minor structural and nonstructural flood mitigation measures with such major structures as embankments, polders, and drainage systems. The goals of these guidelines are:

- Enhance the beneficial effects of investments made in and near the project area.
- Specify measures that will minimize the adverse impact of full or partial failure of FCD or FCD/I structures during extreme floods.
- Assist in the planning and implementation of remedial measures that will assist those living in areas likely to be adversely affected by FCD and FCD/I projects.

The findings of the FAP 14 study indicate that these guidelines and recommendations are applicable not only to FAP projects but also to:

- The planning, design, and management of embankment projects constructed by local or municipal governments.
- Planning and design that will mitigate the socioeconomic effects of non-FAP canal digging and rural road programs.
- The planning, design, and management of integrated rural development projects and programs.
- Agriculture and infrastructure development in flood prone areas or in areas where major flood control structures may not be technically or economically feasible.
- Projects and programs in areas where major structural measures are feasible but cannot be undertaken in the near term owing to institutional and resource constraints.

1.2 Relationship with Other Guidelines

Other sets of guidelines have been prepared or are in the process of being prepared under the Flood Action Plan.

The Guidelines for Project Assessment (GPA) are intended for use in the evaluation of proposed projects. The GPA focuses on establishing uniform procedures for economic appraisal within the framework of a multicriteria analysis (Flood Action Plan 1992b).

The Guidelines for Environmental Impact Assessment (EIA) will ensure that the environmental consequences of a project are evaluated. They also will facilitate the planning and design of environmental mitigation measures for implemented projects (ISPAN 1992a) and the formulation of an Environmental Management Plan (EMP). Both the GPA and the EIA guidelines are project-oriented, and have one or more major structures as their centerpiece.

The Flood Response Guidelines (FRG) take a more comprehensive approach to coping with floods. Their aim is to minimize flood losses and to enhance and sustain the development potential of individuals and social groups in flood environments. Applying the FRG to FAP regional studies and projects will help planning, design, and execution operate in partnership and collaboration with the local people and institutions. The FRG specifically addresses local government bodies, NGOs, all government welfare and development services, and the planners of specific FCD and FCD/I projects under the Flood Action Plan.

The Guidelines for People's Participation (GPP) will provide a set of standards and requirements for people's participation in all phases of project planning. The GPP will provide specific instructions about the composition and qualifications of the planning team. The FAP 14 guidelines complement the GPP in terms of approach and methodology of participatory planning (Flood Plan Coordination Organization 1992).

1.3 Flood Proofing Guidelines

The general principles of flood proofing strategies are defined and discussed in the Draft Guidelines for Planning of Flood Proofing Measures. These principles were based on the findings of both the Flood Proofing Study (FAP 23) and the Flood Response Study (FAP 14). They especially apply to flood proofing measures in small urban areas and in rural villages (Flood Action Plan 1992a).

The guidelines recommend flood proofing measures that seek to maintain public services and infrastructure, reduce loss of life and suffering, and protect property and assets. Among the measures it recommends are:

- Raising floor levels of houses and homesteads.
- Providing flood shelters.
- Providing storage areas.
- Implementing local drainage schemes.
- Protecting embankments and drainage in small urban areas.
- Protecting commercial premises.
- Raising ground levels at markets, schools, and in other communal areas.
- Ensuring that key infrastructures remain above specific flood levels.
- Ensuring that a variety of transport modes can operate effectively during floods.

1.4 FAP 14: Flood Preparedness

The basic principle of flood preparedness is to give individuals or institutions the short term means to reduce the disruption and damage caused by floods. Such preparedness primarily involves developing service delivery systems that people or institutions can use before, during, or after a flood. It often consists of making flood proofing preparations such as moving people to flood-proofed structures before or during severe floods.

The FAP 14 study investigated patterns of flood response in eight discrete Bangladesh flood environments.[1] The study sample represents the physical, social, and economic conditions of each environment and describes the processes involved in local responses to damaging floods. The study also examined people's action preferences, as well as their perceptions of the potential for more effective coping and mitigation--with particular emphasis on the delivery of services by existing institutions. One of the most important points the study makes is that the selection of a particular flood response, including flood proofing, is dictated not only by the type of flood environment involved but also by the preferences and resources of the individuals, households, and communities in that environment. There is not a single uniform set of responses. Therefore, it is impossible to make recommendations and guidelines that can be applied evenly throughout the entire flood plain. Furthermore, each FAP region has a variety of flood environments. Even a single project can easily encompass several different environments. Therefore, it is important that regional and project feasibility studies consider all aspects of each flood environment both with and without the project. Such studies must identify response measures that will complement the project, enhance the FCD/I investment, and maximize the welfare of the households and communities that will be affected, directly or indirectly, by the project.

2. General Guidelines

The FAP 14 surveys explored the effects of flooding on the people of Bangladesh. Planners should seek to mitigate the most damaging of those effects as an integral part of the broad program of flood actions for the country.

The planning goal for all such actions should be to establish flood preparedness and flood proofing programs that provide people with: 1) general information about flood risks and the ways to deal with them, including preparation and flood proofing measures; 2) flood warning that conveys timely information about nearby conditions; 3) a flood-proofed infrastructure that can sustain basic commerce, transportation, and communications during floods; and 4) secure refuge areas that people can use during severe floods.[2]

---

[1]The 30 FAP-14 sample villages were distributed throughout the six FAP geographic regions. Regional planners may refer to the FAP 14 Final Report and Appendices for information about specific villages or upazilas in a region, or consider the findings on the flood environments found in the region.

[2] L. Douglas James, personal communication, 26 February 1992.

2.1 Warning and Emergency Relief

The survey found that most frequently mentioned flood related needs are flood warning and emergency relief.

Most of the people surveyed relied on informal sources (neighbors) for advance warning of storms or flood. The only formal source of such information is the radio, but its reports are not detailed enough and not location specific. Therefore, planners should devise a warning system applicable to the circumstances of each village, taking into consideration its degree of isolation and available means of communication.

The civil employees of the union parishad are not trained to organize and implement flood response activities. Therefore, training programs are needed to enhance the union's flood preparation capabilities. According to those surveyed, the union also should play a larger role in providing emergency relief and rehabilitation.

2.2 Agricultural Production and Food Supply

Most households farm for their own consumption and subsistence. For the majority, any flood related production loss is disastrous. Therefore, many respondents said food supplies should be a major component of relief operations following a severe flood. Respondents also said resuming production quickly after floods is a priority.

2.3 Priorities of Vulnerable People

The survey found that flood response is affected by socioeconomic status (though to a lesser degree than it is influenced by the flood environment). The main characteristics the study used to distinguish socioeconomic groups were land ownership and occupation.

Planners should give priority to the needs of vulnerable groups: the landless, small farmers, fishermen, and female heads of household. These people often have low incomes, few resources, and few opportunities; they survive precariously, and the impact proposed interventions will have on them should be assessed.

Women should get special planning consideration because they are more deprived than men and have fewer opportunities to change their conditions. Moreover, the scope of women's responsibilities, which includes a share of the agricultural work, suggests that they have as much at stake as men do in floods. Much of women's routine work is essential to meeting basic family needs. Their duties include obtaining drinking water and cooking fuel, cooking, maintaining grain stores (including seed grains), drying grain, and feeding and tending livestock. All of this work becomes much more difficult during floods. Therefore, women should be involved in planning for local change in the water regime.

Female heads of household, who have fewer resources at their disposal, require even more attention. Their households are more economically distressed than others, and because they have fewer people to perform necessary tasks, they may be less able to cope with a crisis.

Nearly half of all the women interviewed said they were fully or partially supporting themselves and/or some other persons. They did so either through paid employment or through produce of their lands. Nearly two-thirds said they had experienced food shortages during the rainy season because of lack of money, inclement weather, or the agricultural cycle itself.

Women's most valuable assets included cooking pots and other vessels, animals, tools or equipment, and houses and lands. The most important social asset, the extended family, was available to nearly all women in the study. Non-kin ties with neighbors, patrons, and local groups also counted among the social resources available during flood crises. Despite this social support, seventy-one percent of the women interviewed had suffered serious losses during flood, and less than 10 percent either had to sell or mortgage their most valuable assets. Two-thirds of the women surveyed had borrowed money during the most recent flood. The main reasons for borrowing were to buy food, repair the house, and because of general poverty due to unemployment and the deprivation caused by the flood.

2.4 Characterization of Flood Environment as a Planning Approach

The survey found that patterns of flooding response were influenced by the properties of the flooding source. Therefore, categorizing planning areas by flood environment is a useful way to organize data and the elements of a plan.

Each flood environment has an associated set of specific needs. Within a given environment, individual villages and social groups within those villages may have slightly divergent needs that are subsets of the whole. In all cases, household surveys can define site-specific flood related considerations. Planners can then use this information to formulate project goals and establish a motivational base for encouraging more effective use of nonstructural or minor structural programs.

Following are some of the characteristic flood response patterns of the surveyed flood environments.

Chars

The agricultural productivity of chars is poor because of their typically sandy soil. The people who live in this environment are highly transient, they move from place to place as land disappears, and they sometimes have difficulty reclaiming land when it emerges. These people are impoverished, they have poor public facilities, and their education level is low. Some villages have many commercial fishermen. Char houses are built of lightweight materials that are easily damaged by floods. Most chars were affected by the 1988 floods. In two study chars, floor levels were routinely raised in preparation for the annual monsoon, and in one it was common to build a protective barrier around the whole homestead. Many char residents camp on embankments during floods and, therefore, feel the need for emergency shelters. Information about rises in water level needs to be improved, and transport is needed to move people to emergency shelter when it becomes necessary.

Beels and Haors

Flood responses in these two environments are similar. Although they are deeply flooded for a long period each year, the populations of these environments are settled, and their houses are more sturdily built than those of chars. Relatively high yields of HYV boro crops are reported for beels and haors, and rice production overall is high. Trading activity in these environments

accelerates during the monsoon season, when boats become an important means of transport. In two study beels, people routinely constructed barriers around their homesteads. When evacuation became necessary, they usually found shelter in higher houses in the same village. Beel and haor villages had fewer tubewells than other types of study villages, which made it difficult to obtain safe drinking water during floods. Flood warnings are needed to allow for early harvesting of crops.

Main Rivers

Cropping patterns along main rivers depend upon land elevation, flood duration, and level of flood protection. There is enthusiasm in this environment for eliminating the effects of severe floods, but less for changing the effects of average floods or normal rainfall. This environment comprised a wide range of flood experience, as well as a diversity of preparation and response measures. It included many protected households where few preparations for flood were made. Since they are nonetheless likely to be affected by severe flood, these areas may need information about what to do when breaches occur.

Secondary Rivers

Cropping patterns, like those for main rivers, depend on land elevation, flood duration, and level of flood protection. Study village populations (like those in flash flood environments) do less monsoon season subsistence fishing than those in other environments. There is somewhat less interest in changing severe flood than in the main river environment. There is a stronger interest in storm warning than in some other environments.

Flash Flood Areas

By nature, flash floods are sudden, difficult to predict, events. It is hardly surprising then that those who are subject to their effects should be most interested in improved flood and storm warnings.

Semi-Saline/Empoldered Areas

Waterlogging, or drainage congestion, is a bigger problem than flooding is in semi-saline and empoldered areas. Strong conflicts exist here between the competing interests of farmers and shrimp cultivators. Households in these areas prepare less for floods than those in other environments do, and the numerous earth-walled houses, which often collapse if water enters, reflect a comparatively low-risk experience of severe flood. The people have a strong interest storm warning systems, and the survey indicated that there also may be a need to prepare them to respond to breaches.

Embankment Breach Locations

Because of their history, wherever embankments occur there is much skepticism and controversy about them and dissatisfaction with breach warning and notification systems. Existing flood adjustments tend to follow the pattern of the general environment involved (e.g., main river or beel). There is a need for local breach warning and emergency preparedness, as well as an information campaign to increase local awareness of continued risks.

3. Guidelines for Evaluation of Flood Response

3.1 Structural and Nonstructural Solutions

It is common to set up a dichotomy between structural solutions, such as building embankments, and nonstructural solutions, such as increasing disaster preparedness or flood proofing, but the observations of the surveyed population do not support this kind of either/or thinking.

The study found that most of those surveyed wanted to reduce the effects of severe floods (through flood control structures and drainage facilities); fewer felt a need to change what they considered average flood; and very few wished to eliminate the effects of normal monsoon inundations. This appears to support the FAP concept of controlled flooding rather than reduced normal monsoon water levels.

Some structural solutions were found desirable. Drainage is particularly important in chars, beels and haors, where full flood protection is impractical or unlikely. Moreover, a structural solution did not always consist of building something new. Sometimes, for example, it meant re-excavating a drainage channel or fixing a broken sluice gate. Where there were flood protection structures there was not necessarily an absence of flood problems. Indeed, protected villages that were selected for study often still had some unsolved water problems, such as waterlogging (in polders) or embankment breaches. Problem-prone protected villages are not assumed to be typical of average FCD projects, but the point remains that existing protective structures did not always eliminate flood risk, particularly for severe floods such as those of 1987 and 1988.

Although existing structures had problems, those problems did not lead to the conclusion that structural solutions should be abandoned. Rather, they highlighted the need for local participation in the design of structures and in operation and maintenance.

3.2 Recognizing Competing or Conflicting Local Interests

The needs of people who would benefit from a proposed project should be carefully balanced against the needs of those who would be harmed by it. In some areas there are intense conflicts over flood control, which were reflected in the highly mixed evaluations over hypothetical or actual structures. The Flood Action Plan needs to minimize flood losses and improve local ability to recover from flood wherever flood risks will continue or may appear as a result of a planned project.

3.3 Flood Action and Economic Development

Many flood problems and their solutions must be viewed in the context of the economic development goals and programs of the nation as a whole. It is impossible to separate the way in which a family or a village prepares for or copes with flood from the way in which economic and other resources become available to support local activities. Those with the fewest resources to begin with are the most vulnerable to disastrous economic loss. Problems of unemployment or inadequate income are thus at the heart of the difficulties of many families during floods. Increased availability of income-generating and credit opportunities would help mitigate flood crisis and prevent economic catastrophes.

3.4 Priority Local Concerns: Flood Preparation, Coping, and Recovery

At the household and village level certain issues figured prominently in all aspects of the FAP 14 study:

- Storm and flood warning.
- Emergency shelter (with privacy arrangements).
- Cooking fuel.
- Safe drinking water.
- Obtaining food (a problem of lack of money/unemployment).
- Cooking and eating.
- Sanitation facilities.
- Animal care.
- Fodder supply.
- Protecting crops and fisheries resources (pond fish).
- Grain storage/drying facilities.
- Receiving timely inputs to replant after crop loss.
- Repairing homes.
- Employment continuity.
- Road, embankment, or other infrastructure repair.

In addition to these priorities, many others, such as security and midwifery, were mentioned in discussions and structured interviews. Some needs clearly are limited to severe flood conditions, while others are seasonal problems for many families, especially the poor. The interests of men and women on each of these points may be different, so planners are advised to discuss pertinent program features with both.

3.5 Needs and Interests of People Living in Specific Flood Environments

Emergency shelter was of greatest importance to those living in the most severely affected areas, namely chars, beels, and haors. Fewer than 20 percent of the sample in severely or deeply flooded areas had access to public high ground during floods. Households in such areas rated public high ground shelter a high priority. Public shelters also received positive evaluations in all other environments and across socioeconomic categories. The one exception was in flash flood areas, where floods, although destructive, are of short duration and do not require such measures.

Purifying drinking water, while important to all, was of particular concern in villages where there are few tubewells--beels and haors in this study. One suggestion made in a group interview was that the upazila should distribute purification tablets.

Storm warning and flood information were priorities for most households, and nearly all those surveyed got some kind of flood information. The only formal source of such information, radio, does not provide much information on lesser rivers, however. Hence, households in those environments get little relevant flood information from the radio. This suggests that there may be a need for improved flood information in secondary river locations. Regional radio stations may be equipped to answer this need.

Respondents generally rated protective embankment options and drainage improvements helpful. Road options also received favorable assessments. Those who were not protected by high encircling polders, though, gave them more favorable assessments than those who were. The opinions of the latter need to be assessed in light of the fact that some of them were selected because they had embankment breach problems. Similarly, those living between a river and an embankment also thought the structure was harmful, while those living in some riverside locations without embankments regarded them as helpful.

The survey found that each flood environment had distinctive flood protection requirements. Most people living in chars wanted to be free of floods, although some farmers would be happy to reduce and delay normal floods. Many people in main river locations wished to be free of severe floods, but people living in this environment were more concerned with modifying or reducing the rise rate in secondary river floods. A substantial minority of those living in semi-saline polders wished to be flood-free during normal monsoon because of local rainfall and drainage congestion. In the beels, while most people wanted to be free of damaging floods, farmers believe a delay of over a month in flood onset could achieve the desired result. The respondents in one village in the Atrai Basin also wanted slower drainage. Opinions were evenly divided between beel residents who thought protective embankments would be beneficial and those who thought they would be harmful. This is partly due to variations in flood experience. Submersible embankments were regarded as more desirable than full embankments for beels. Many respondents in haor areas wanted to change normal monsoon conditions and most wanted to delay the onset of normal flooding by about a month. Almost everyone in haors wanted faster drainage to help extend the growing season. Here, submersible embankments were considered to be as beneficial as high embankments. People in the flash flood areas wanted normal inundation delayed by a month, and only those whose homes had been flooded strongly favored embankments. The opinions of respondents in breach locations varied according to local circumstances. Some wanted to eliminate floods (main rivers), while others wanted to delay and reduce floods (beels). Opinions about embankments were mixed, but they were regarded favorably overall, despite recent experience.

Local interest groups often have conflicting opinions about structural measures. These are likely to result in operating problems if projects are implemented without first addressing their concerns. Although there were some differences of opinion between groups with regard to nonstructural flood-loss mitigation measures, there were no serious divisions of interest overall. By comparison, there was little variation in the broad favorable assessment of roads. One exception was a road that regarded as more beneficial than a road-embankment or embankment.

Other flood-loss mitigation measures were considered. Embankment breach warnings are relevant to those who had flood protection and believed such warnings would be helpful (no such service now exists). Those in FCD projects, on the other hand, did not think that informing authorities when a breach occurred was useful. Storm warnings were usually regarded to be helpful in all areas. Public high ground flood shelters also were deemed very helpful. Public grain drying facilities were regarded as more helpful by farmers, particularly larger farmers, but also were considered a high priority in the haor and beel locations. Credit for building a pucca (flood proof) house was perceived to be helpful by wealthier households, which might expect access to such credit. Such credit was not considered helpful in the chars, perhaps because of overall impoverishment or because of the inherent uncertainty of trying to live on eroding land.

Desire for irrigation facilities appeared to be related to institutional factors such as credit, at least in river environments. Not surprisingly, irrigation was rated as helpful by farmers, especially larger ones, but was less of a priority in char areas, where more direct flood mitigation measures were preferred.

Finally, grain stores were investigated as a means of avoiding flood losses and as a form of insurance/collateral after floods. They were not found to be a high priority, although they were rated slightly better in the haors and beels, particularly among larger farmers. In addition, allowing distant institutions (union or upazila) more control of grain stores was less preferred than giving that control to the village community.

The results of these evaluations show that it is imperative to carefully assess the perceived needs and interests of local communities, and to incorporate their ideas into detailed flood planning. The results point to the potential priorities in each flood environment. Planners should consider and develop these priorities at an early stage. Local consultation will be needed to refine the details for any given locality, to discern local support for particular measures, and to direct those measure at the appropriate target groups.

3.6 Specific Needs Checklist

The FAP 14 institutional survey found that institutions have been rather ad hoc in their flood response activities. For these institutions to play an optimum role in flood response, they will have to collaborate and coordinate activities with one another while devising and implementing programs and projects. They should consider the needs and aspirations of the socioeconomic groups living in the areas that will be directly or indirectly affected by those programs and projects.
The flood response study revealed the specific needs of those living within flood prone areas. After immediate physical safety, they represent the most pressing needs during floods. Among them were: adequate drainage, pure household water, health facilities, transport, fuel, credit, house construction materials, education, local high ground for shelters, and family cohesion. These things are largely interrelated, and they are not exclusive to areas where embankments exist or where there is a strong preference for them. Therefore, these needs not only should be explicitly addressed in regional studies but also in project design studies. A project that sets aside these issues, even if, for example, it increases agricultural productivity, will be seen by its intended beneficiaries as having little useful impact.

Both the household and the institutional surveys asked what flood preparatory and flood coping measures were being provided by the neighborhood, NGOs, and various levels of government. The surveys also asked respondents to suggest measures they wanted these institutions to provide. Table 1 is a checklist that planners can use to determine those measures considered most important in an area and then to decide which institution should provide them.

Table 1

Checklist of Recommended Preparatory and Coping Measures by Type of Measure and Institutional Source

Type of Measure	Neigh-borhood	Union Parishad	Upazila Parishad (Thana)	District	NGO
Preparatory Measures					
Flood Warning	***	*	*****		
Arrange for Shelter	*	**	***		**
Reinforce Houses and Homesteads	**	****	****		
Arrange for Flood-Time Transport and Communication	***	*	****		
Arrange for Storage	***	***	****		
Protect Crops, Cattle, and Fisheries	****	****	****		
Repair/Construct Small Scale Embankments		*	***		**
Repair/Construct Roads		**	***		**
Improve Drainage		**	**		*
Flood Coping Measures					
During Flood					
Provide Shelter	****	***	***	****	*
Supply Drinking Water	****	****	****	****	**
Provide Emergency Relief	****	*****	*****	****	****
Provide Health Care	*	**	****	****	***
Supply Fuel	**	***	**	*	
Protect Crops, Cattle, and Fisheries	***	*****	****	**	
Protect Stored Food	**	***	****	*	
Provide Marketing Services	**	****	****	**	
Provide Credit			*		**
After Flood					
Repair/Construct Houses/Homesteads	***	*****	****	****	***
Provide Health Care	**	****	*****	****	***
Supply Agriculture Inputs	**	***	*****	****	**
Repair Infrastructure	**	*****	****	****	**
Provide Security	*				

Asterisks indicate the approximate magnitude of importance on a scale where one asterisk equals about 10 percent of either respondents from the Household Survey, or villages from the Institutional Survey suggesting the measure, up to a maximum of four asterisks, except where five are used to indicate exceptional support.

4. Program and Policy Recommendations

- A policy strongly supportive of people's participation in local project planning for any change or modification in the water regime is recommended. At the program level, careful assessment of perceived needs and interests should be incorporated into the detailed planning for any area, and localized findings should be the basis for high-level planning decisions. If committees are established as a means for local-level participatory planning, they should represent all socioeconomic groups and should include both men and women.

- Policies should ensure that any relief or flood recovery programs give special consideration to the needs of economically disadvantaged groups to help them avoid selling or mortgaging basic productive assets (such as land, tools, or cattle). Programs that would help should involve employment, credit, rescheduling loans, outright grants, and insurance that emphasizes compensating losses of the very poor.

- Programs to improve flood and storm warning systems are needed in almost all environments. Radio announcements should provide information on more regions and environments. Local government could deploy drum-beaters or other message carriers.

- Flood protection projects enable a shift in cropping patterns dominated by high-yielding varieties. Such projects, however, are still plagued by crop losses from floods and waterlogging. Therefore, flood action plans for people living within these projects, or proposed new projects, should include both flood preparedness and flood proofing components appropriate to the specific circumstances of the locality.

- Study findings support a policy that has local beneficiaries contribute to embankment costs to enhance local commitment to operation and maintenance of the structure.

- The most common response to recover crops lost to flooding is to increase the area cultivated in subsequent cropping seasons. There should be contingency plans from the government to facilitate such efforts. Such plans might consider low-cost credit, adequate and timely supply of inputs, and work on roads or other transport arrangements to facilitate delivery of supplies.

- Supplemental irrigation should be considered as a way to increase food grain production. This recommendation is based on the finding that lands experiencing short-duration floods, which are suitable for growing HYV aus, have low cropping intensity during the kharif-1 season.

- Programs are needed to encourage increased agriculture within protected areas. It is recommended that farmers be involved in internal water management and planning needs (e.g., drainage system improvements or even controlled flooding). There also is a need for improved information on flood risk.

- The potential of local formal or informal groups to prepare for and respond to floods should be included when developing programs. This might include an intensive drive to

increase rural people's awareness about ways in which they could work together during floods. Such as drive could be followed by appropriate training programs.

- This study's findings about people's expectations of local government lend support to policy initiatives that would increase the responsibilities of the union parishad. Such responsibility should include authority to generate revenues for undertaking locally feasible flood preparedness and flood proofing measures.

- Infrastructure projects of different unions should be designed with local cooperation so that they do not interfere with each other.

- Local training programs to improve flood response should collaborate with NGOs wherever possible.

- The thana (formerly upazila) level of government is suitable to develop and manage storm and flood warning systems by using the available telecommunications network. It should especially use these resources to obtain information and disseminate it to villages. The thana also should maintain a reserve fund and maintain boats for use in emergencies.

- Food For Work programs should be diversified to cover locally initiated flood proofing activities, such as raising public grounds for emergency shelter, raising pond banks, building culverts and simple bridges, and repairing and maintaining embankments and roads.

- The Agriculture, Livestock and Fisheries Offices extension services need to be geared toward flood proofing and the flood coping needs of the rural population. These offices should collaborate in the design and implementation of rehabilitation programs to help meet flood recovery needs of the affected people.

- Upazila efforts to provide health care should be improved. There is a great need to provide adequate emergency medicine supplies, such as anti-diarrhoeal rehydration therapy and water purification tablets. The development of mobile health teams would help deal with the medical situation during flood.

- The district level should have a mandate to improve coordination among offices such as BWDB, LGEB, Agriculture Office, Fisheries Office, and the Civil Surgeon's Office.

5. The Need for Policy Direction

- There is a need to adopt the multiple-objective conceptual approach to planning. Social considerations must be integrated throughout the planning process, combining structural and nonstructural measures and their implementation and management. With such an approach, planners can define popular concerns, gather information on what people are doing to solve these problems, define actions that the government or others can take to help achieve those goals, and select a cost-effective program within resource constraints.

The selected activities should be monitored as they are implemented, revised whenever improvements can be made, or dropped whenever they prove ineffective.

- High-level policy direction is essential to the success of all recommended programs. Of special importance are policies to: (1) integrate women's interests into rural development planning; (2) implement flood action planning in such a way that it alleviates poverty; (3) ensure that people's participation will be a part of any project or program; and (4) improve coordination among the regional and local offices of all line ministries.

REFERENCES

Flood Action Plan. 1990. Bangladesh Action Plan for Flood Control: Terms of Reference for Flood Response Study (Flood Action Plan No. 14). Dhaka: Flood Plan Coordination Organization, Ministry of Irrigation, Water Development and Flood Control. Mimeo.

_____. 1991a FAP 12 FCD/I Agricultural Study. Draft Final Report, Summaries of PIE Survey Reports. Dhaka: Flood Plan Coordination Organization, Ministry of Irrigation, Water Development and Flood Control. (Report prepared by Hunting Technical Services Limited in association with the Bangladesh Institute of Development Studies.)

_____. 1991b FAP 12 FCD/I Agricultural Study. Draft Final Report, Summary and Recommendations. Dhaka: Flood Plan Coordination Organization, Ministry of Irrigation, Water Development and Flood Control. (Report prepared by Hunting Technical Services Limited in association with the Bangladesh Institute of Development Studies.)

_____. 1992a. Flood Proofing Study FAP 23: Draft Guidelines for Planning of Flood Proofing Measures. Dhaka: Flood Plan Coordination Organization, Ministry of Irrigation, Water Development and Flood Control. (Report prepared by Irrigation Support Project for Asia and the Near East/ISPAN.)

_____. 1992b. Guidelines for Project Assessment. Dhaka: Flood Plan Coordination Organization, Ministry of Irrigation, Water Development and Flood Control.

Flood Plan Coordination Organization. 1992. Draft Guidelines for People's Participation. Dhaka. Draft manuscript.

ISPAN (Irrigation Support Project for Asia and the Near East). 1992a. Draft Guidelines for Environmental Impact Assessment. Dhaka.

_____. 1992b. Guidelines for Participatory Development. Draft manuscript submitted to Flood Plan Coordination Organization for revision.

Master Plan Organization (MPO), Ministry of Irrigation, Water Development and Flood Control. 1987. Agricultural Production Systems. Technical Report No. 14. Dhaka.

_____. 1991. National Water Plan. Dhaka.

Paul, B.K. 1984. Perception of and Agricultural Adjustment to Floods in Jamuna Floodplain, Bangladesh. Human Ecology 12(1)3-19.

Salim, Muhammad. 1990. Village-Level Studies on Rice-Based Cropping System in the Low-Lying Areas of Bangladesh. Japanese Journal of Crop Science 59(3)518-527.

Thompson, Paul M. 1990. Impact of Flood Control on Agricultural Development; Post Evaluation of the Chandpur Irrigation Project. Enfield, UK: Middlesex Polytechnic, Flood Hazard Research Centre.